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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/540,250	01/05/2006	Shigeo Shirakura	Q88724	8274

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EXAMINER	
HOBAN, MATTHEW E	

ART UNIT	PAPER NUMBER
1793	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/540,250	SHIRAKURA, SHIGEO	
	Examiner	Art Unit	
	Matthew E. Hoban	1793	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *15 May 2008*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *6-10* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *6-10* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *5/15/2008*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 112

1. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

2. Claims 6-10 rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

3. Claims 6-10 rejected under 35 U.S.C. 112, second paragraph, as being incomplete for omitting essential steps, such omission amounting to a gap between the steps. See MPEP § 2172.01. The claims include no steps in the method, where the claims are directed to a method for producing an apparatus.

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2. The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.

2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

3. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

4. Claims 6-10 rejected under 35 U.S.C. 103(a) as being unpatentable over Hervert et al in 3,785,781 as applied to claims 1-5 as shown above, and further in view of Pfefferle in 4,407,785

Hervert teaches a method of producing a catalytic honeycomb monolith having differing channel sizes in Column 5 Line 65 through Column 6, Line 17. This part of the disclosure refers to Figure 3, which can be seen to have 3 different elements, where each element is said to be impregnated with catalytically active material. Therefore, there are no unnecessary skeletal structures in this embodiment of Hervert's teachings. Furthermore, Hervert teaches this same theory at Column 2, lines 15-33, where he explains the catalyst structure, and

states that the second structure can either be inactive, but it is preferably catalytically activated. Therefore, these catalytic structures as taught by Hervert fully encompass the structure as delineated in the claims, which now include "consisting of" language.

Hervert's catalyst includes both inlet and outlet means connected by a plurality of flow paths (honeycomb structure, see Column 2, Lines 34-53). The honeycomb structure is treated so that it becomes catalytically active, which means that any catalysis would occur on the sidewalls of the flow paths (See Column 4, Lines 53-70). It is not stated explicitly that the structure is used for flue gas NOx catalysis, but the Summary of the Invention states that the "primary object of the present invention [is] to provide for the method and means for catalytically converting fluids such as exhaust gas." It was previously mentioned at Column1 Lines 37-45, that oxides of nitrogen are waste products in automobile exhaust flow. Therefore, the claimed invention would have been envisaged for one of ordinary skill in the art to use Hervert's invention as a NOx catalyst, where this would only necessitate selecting a suitable catalyst, which is a task that is well within one of ordinary skill in the art and is outlined in the paragraph bridging columns 4 and 5. Regardless the monoliths use as a flue gas NOX removal apparatus is an inherent use for the as produced product. The use of this NOX removal apparatus in a flue gas does not impart any limitations on apparatus.

As was stated previously, the length of Hervert's catalyst is defined by several (Hervert uses three) catalytically active honeycombs with varying pore sizes. The length of each honeycomb is defined by the length that the fluid maintains turbulent flow, where Hervert defines turbulent flow as having "an initial square velocity profile". When the velocity profile becomes parabolic and the boundary layer becomes stagnant, catalytic activity decreases. At this point, a second honeycomb structure with a different pore structure is used to reestablish turbulent flow. This process is repeated one more time, making a total of three different honeycomb structures with turbulent flow throughout. Although the length of each of these honeycombs is not defined by the equations as found in the instant claims and the explicit lengths found in claims 8, they are governed by the same theories and assumptions. Thus the honeycomb structures of both Hervert and the instant claims would be of essentially the same length, even though Hervert defines his length based on velocity profiles, and the instant claims define the length in terms of a formula. Based on the disclosure of Hevert, one of ordinary skill in the art would be able to form a catalyst of the length specified in Claims 8 of between 300 and 450 mm for an exhaust (flue) gas under the conditions delineated in claim 7 (6 m/s gas flow rate and 6mm aperture size). At the specified length in claims 8, the gas flow would exhibit straightening or in the words of Hervert would assume a parabolic velocity profile (See Column 5, Lines 8-53).

Therefore, in view of the disclosure of Hervert, the application of his invention to a catalyst under specific gas flow rates and aperture sizes is well within the skill of one of ordinary skill in the art. The formulae used to define the length of the catalyst only serve as an equivalent way of defining the length of the catalyst as already defined by Hervert, where Hervert defined this natural phenomenon in terms of velocity profile. In light of this fact, it would therefore be inherent for a catalyst that meets the velocity profile of Hervert to also fall into the equations described in the instant claims. Furthermore, the use of several different catalyst stages (Hervert uses 3) in order to retain turbulent flow is used explicitly by Hervert.

Hervert fails to teach the space in between catalyst layers for the intermingling of gases as stated in Claim 6.

However, Pfefferle teaches that in a multi-stage gas catalyst such as that of Hervert, it is advantageous to include spaces between the catalyst layers. Pfefferle's disclosure states that these air gaps positively affect the catalyst's efficiency. The spaces allow the gas to commingle with gas from other flow through paths. This means that if one path were to be catalytically deactivated, the gas from this path would mix with partially catalyzed gasses from a functioning path and then would be introduced into the next catalyst layer. Due to this configuration, the gas flow within the catalyst would maintain a constant

turbulent state and would be more uniformly catalyzed (See Column 5). Pfefferle also realizes the advantage of maintaining turbulent flow in the catalyst. The reason for this deals with the rate of mass transfer and the fact that it increases when turbulent flow is maintained.

The combination of these two products would have been obvious to one of ordinary skill in the art and has clear motivation in that it allows a flue gas to be catalyzed more efficiently and homogeneously. This leads to lower emissions, especially after the catalytic body sees significant use. The catalyst by the combination of these two teachings could be produced in a manner very similar to that of Hervert mentioned in the previous 102/103 rejection, where air spaces would be disposed between the three catalytic layers, rather than being in direct contact with one another.

Lastly, these two references are from analogous art, as they both deal with honeycomb catalyst design.

Regarding Claim 6: As stated at column 5, line 65 through column 6, line 17, Hervert teaches a method of producing a catalyst including three different active zones. The catalyst is stated as being useful in cars to remove noxious compounds including oxides of nitrogen (See Column 1, Lines 36-45). Pfefferle teaches the desirability of including

air gaps between multi-component catalytic honeycomb structures to let gas commingle. The method of making a catalytic structure of Hervert in view of Pfefferle would be obvious in light of the method steps given by Hervert. It is noted that the claim is directed towards a method of making a flue gas NOX removal apparatus. The use of the NOX removal apparatus in flue gas as opposed to engine exhaust gas is an intended use of the product and therefore doesn't offer patentable distinction over Hervert in view of Pfefferle. Furthermore, as taught by Hervert, the length of the catalyst structures should be the length where a square velocity profile is maintained, or in other words, a length where turbulent flow is maintained (See Column 5). Therefore, Hervert in view of Pfefferle make obvious all aspects of Claim 6.

Regarding Claim 7: The equation in claim 7 is directed towards the length of turbulent flow. Hervert defines the length of his catalyst by a length where a square velocity profile is maintained. He goes on to relate this to the concentration of reactants. When the flow is not turbulent, a stagnant layer develops on the catalyst wall, causing reaction only in this stagnant layer. This creates a parabolic velocity profile, but also creates a concentration of profile that is no longer square, due to the fact that catalysis only occurs in this stagnant layer (See Column 5).

Regarding Claim 8: Based on the disclosure of Hevert, one of ordinary skill in the art would be able to form a catalyst of the length specified in Claims 8 of between 300 and 450 mm for an exhaust (flue) gas under the conditions delineated in claim 2 (6 m/s gas

flow rate and 6mm aperture size). At the specified length in claims 8, the gas flow would exhibit straightening or in the words of Hervert would assume a parabolic velocity profile (See Column 5, Lines 8-53). Therefore, by following the example of Hervert, one would arrive at the same explicit lengths. This is due to the fact that both the instant claims and Hervert are governed by the transition from turbulence to laminar flow.

Regarding Claim 9-10: Hervert uses 3 stages (See Figure 3 Column 2, Lines 15-35 and the paragraph bridging Column 5 and 6).

Response to Arguments

1. Applicant's arguments with respect to claims 6-10 have been considered but are moot in view of the new ground(s) of rejection. Hervert teaches both embodiments including non-catalytic intermediates, and catalytically active intermediate stages. The new rejection is based on the same reference but is directed more pertinently towards specific areas in Hervert, which clearly enunciate this fact. Applicant's arguments still seem pertinent and will now be addressed. The first argument on page six has been considered in this new rejection. Hervert teaches several embodiments of his invention, where some may include non-active elements. The instant rejection is pointed towards those embodiments with only active elements. Such embodiments can be found at Column 5/6 and column2, lines 15-35. These specific embodiments consist of only active elements. Applicant also argues that the length of Hervert's catalyst is tied to the concentration gradient. It is true that this is stated, however, it is clearly enunciated by

Herve't that the concentration gradient and velocity profile are integrally related. When the velocity profile becomes parabolic, the concentration profile will no longer be square based on the fact that catalysis will occur predominately in a stagnant layer along the catalyst wall, inhibiting mass transfer from the bulk fluid. So although Hervert does not define his length by Lb, both Hervert and the claimed invention define length based on the length of turbulent flow. To put it bluntly, both Hervert and the applicants claim length based on the same phenomena, but define this phenomena in different ways. Either route ultimately arrives at the same solution.

Conclusion

2. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL.** See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of

the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Matthew E. Hoban whose telephone number is (571) 270-3585. The examiner can normally be reached on Monday - Friday from 7:30 AM to 5 PM EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jerry Lorengo can be reached on (571) 272-1233. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Jerry A Lorengo/
Supervisory Patent Examiner, Art Unit 1793

meh